

## Recognition of endangered and protected species in the flora and their current condition: an example from Sokołowiec forest administration region (Oleśnica forest district)

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**Abstract.** This article is an attempt to draw attention to the differentiation used to conserve endangered and protected species of flora in an area that is administered by the management board of the State Forests. I also draw attention to areas of insufficient knowledge of this subject-matter. A detailed inventory of endangered and protected species of flora for the purpose of planning in forestry would be very useful in light of laws related to nature conservation and the problem of preserving biological diversity. Research in the forest administration region of Sokołowiec indicates that almost 2/3 (65.16%) of all sites harbouring endangered and protected species of flora are new (previously undocumented), despite the existence of numerous protected areas - this fact indicates that there are great research possibilities in this field. The main conclusion from this research confirms that multifunctional forestry in Poland will provide the greatest opportunity to preserve the widespread and numerous sites holding endangered and protected species of flora in economically important forests.

**Key words:** endangered plants, protected plants, forestry, nature protect, biodiversity

### 1. Introduction and the purpose of this study

Nature conservation in Polish forestry has been gaining more and more importance in recent years, although for a long time now foresters have treated it with due care. However, because of the forestry's ecologisation, initiated by the Forest Act of 1991 (Act 1991) and the Decree No. 11A by the Director General of the National Forests of 1999 (PGLLP [Państwowe Gospodarstwo Leśne Lasy Państwowe – The State Forests National Forest Holding] 1999), and continued by, e.g. obligatory drawing up of nature conservation plans for forest districts within the forest management plan, changes in the silviculture or classification of many forest areas as Natura 2000 sites, an important issue seems to be the inventory of the natural resources of individual Forest Districts (Olaczek 2007). This is also a requirement imposed by the Nature Conservation Act (Act 2004) and relevant regulations.

The purpose of this study was to outline the state of knowledge on natural resources of managed forests, remaining under The State Forests National Forest Holding management, against the background of current knowledge on this subject, in particular on endangered and protected plant species. This study is also an attempt to indicate the importance of detailed nature inventory as a database useful for drawing up plans and future modifications of silviculture and conservation activities in the forests.

### 2. Materials and methods

Field studies were carried out at the area of Sokołowiec forest administration region in Oleśnica Forest District (N51°15'42", E17°27'39") – the Regional Directorate of State Forest in Wrocław during two growing seasons in 2009–2010. The studies included the search for the positions of protected plants and those

placed on the local or national lists of the endangered plants, including lichens and bryophyte positions.

To facilitate research, the Sokołowice forest administration region was divided into two parts. In 2009, the first part of the area was examined, which included divisions 180–187, 193, 260A, 261–268 and 202–206, while in 2010, research in the second part of the area was conducted, in the following divisions: 207–217, 271–277 and 297–298.

During the study, every compartment of Sokołowice forest administration region along transects was penetrated. The transects were parallel to the longer side of the compartment and situated 50 m away from each other. Their number depends on the width of the compartment. The observations were repeated in each of the surveyed compartment at the intervals of 2 weeks, starting from early March to mid-September. The areas within the Sokołowice forest administration region but outside the management of the State Forests were also briefly examined.

Plant populations or their parts located in different stands, which were marked in accordance with the Forest Management Plan for Oleśnica Forest District 2003–2012 (BULiGL (Biuro Urządzania Lasu i Geodezji Leśnej – Bureau for Forest Management and Geodesy) 2003) were also recognized as a separate position. For the positions outside the area under the State Forests, management coordinates were given. The nomenclature was adopted from Fałtynowicz (2003), Mirek et al. (2002) and Ochyra et al. (2003), using the keys for the determination of dif-

ferent taxonomic groups of plants (Szafran 1957, 1961; Nowak, Tobolewski 1975; Rothmaler 2009; Rutkowski 2004). Sokołowice forest administration region is located in ATPOL 10×10 km – CE22, CE31 and CE32 squares; individual positions were related to these squares (Zajac, Zajac 2001).

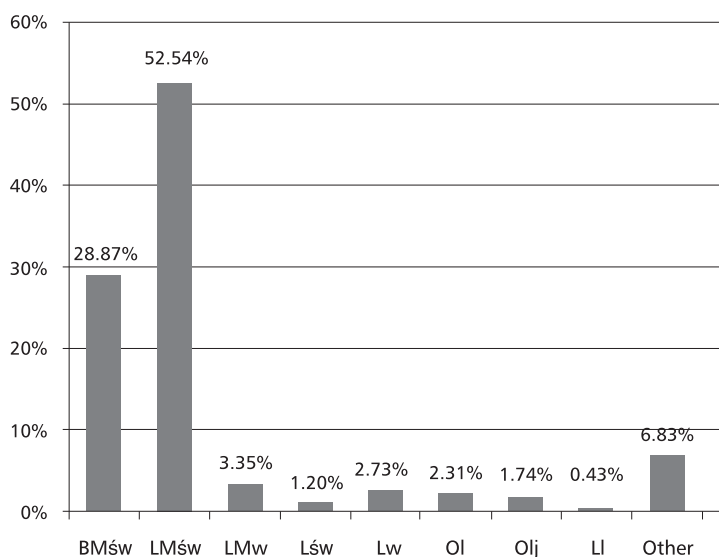
To compare the data, literature review on the nature of the surveyed area, focusing on the positions of endangered and protected plants, was also made (Kossowska, Turzańska 1993; BULiGL 2003; Bazan, Tarnawski 2005a,b, 2007; Gorzelak 2008, in press; Stefańska-Krzaczek, Kącki 2009b).

### 3. Profile of the studied area

The Sokołowice forest administration region (1163.80 ha of the forest area and 2553.74 ha of territorial range) is located entirely on Oleśnica Plain, along the valley of the Oleśnica River, covering both depression as well as higher river terraces and surrounding plains (Kondracki 1988; BULiGL 2003).

According to the geobotanic division, the study area is located in the Department of Brandenburg-Great Poland, Lower Silesia Land, but according to the nature and forestry division, it is in the Lower Silesia Land, Lower Silesia Compartment (Trampler et al. 1990; Matuszkiewicz 1993).

According to Romer, this area's climate belongs to the group of foothill climates of plains and basins, which



**Figure 1.** The percentage participation of the forest site types in Sokołowice forest administration region (Oleśnica forest district)

is the characteristic for the transitional area between the Atlantic and continental climate (Schmuck 1959). The predominance of the oceanic climate results in the mitigation of the annual amplitude and, in consequence, gives mild and short winters, early, humid springs, as well as warm summers (Kondracki 1998).

In the Valley of Oleśnica River, soils associated with river valleys dominate, which are formed with water participation. These are usually semi-hydrogenic and hydrogenic soils. There appear chernozem, gley-podzol soils, boggy soils and pod-boggy soils. On the upper river terraces and adjacent plains, there are also brown soils, i.e. acidic or brown podzolic-rusty (which account for over 80% of the forest) and podzols (Brożek, Zwydak 2003; BULiGL 2003; Gorzelak 2008, in press).

In parallel to geological diversification of the studied area, there is also phytosociological diversification – typical forest communities and numerous meadows and pastures, which remain mostly in private hands could be found there.

The most common communities include: *Quercus roboris-Pinetum*, *Calamagrostio arundinaceae-Quercetum petraeae* and *Leucobryo-Pinetum* – the first two are related to the type of forest side (fresh mixed coniferous forest and fresh mixed broad-leaved forest) and brown podzolic soils, whereas *Leucobryo-Pinetum* is related to the occurrence of podzolic soils and poorer brown podzolic soils (Matuszkiewicz 2002, 2006).

There are also numerous communities related directly or indirectly to water, e.g. *Fraxino-Alnetum*, *Ribesio nigri-Alnetum*, *Ficario-ulmetum minoris* and *Galio sylvatici-Carpinetum betuli* could be also met; however, it is quite rare. Due to several rearing-ponds, there are also communities of *Potametea* or *Phragmitetea*, as well as communities of meadows, swards and pastures of *Molinio-Arrhenatheretea*, *Koelerio-Corynephoretea* or *Nardo-Callunetea* classes (Matuszkiewicz 2002; Bazan, Tarnawski 2005a,b, 2007; Matuszkiewicz 2006; Dzwonko 2007; Gorzelak 2008, in press; Stefańska-Krzaczek, Kącki 2009a,b).

Due to various external influences such as agriculture and forest economies, as well as the impact of nearby settlements, these communities undergo different types of distortion – mono-typisation, fruticetisation, cespitisation, juvenalisation, neophytisation or pinetisation processes (Stefańska-Krzaczek, Kącki 2009a).

Diversification of forest habitat type is also related to soils and is distributed unequally – fresh mixed coniferous forest and fresh mixed broad-leaved forest constitute over 80% (Figure 1.). Some moist mixed

broad-leaved, fresh broad-leaved forest, moist broad-leaved forest, alder swamp forest, ash-alder swamp forest and riparian forest habitat types have been also noted (BULiGL 2003).

Protected areas in the Sokołowiec forest administration region are represented by three ecological sites ('Olsy Spalickie' – 'Spalice Alder Swamp Forest'; 'Olsy Sokołowskie' – 'Sokołowiec Alder Swamp Forest' and 'Mokradła Boguszyckie' – 'Boguszyce Wetlands'), one proposed ecological site ('Uroczysko Grotowskiego – Małe Brzezcie' – 'The Grotowski nature reserve – Małe Brzezcie') and Natura 2000 site 'The Oleśnica River and Boguszycki Stream Valley' (Natura 2000), covering both the areas of the State Forests and the private ones.

## 4. Results

Based on the observations made in the Sokołowiec forest administration region and the analysis of the available literature concerning the studied area, the occurrence of 68 species of protected plants and those having the status of endangered species in the regional and national lists has been noted on 686 positions (Table 1; Kossowska, Turzańska 1993; BULiGL 2003; Bazan, Tarnawski 2005 a, b, 2007; Gorzelak 2008, in press; Stefańska-Krzaczek, Kącki 2009b). Out of these, 52 species are protected (643 positions) and 29 species of various categories are endangered (103 positions). Among the plant species, there are 18 species of mosses (287 positions) and 10 species of lichens (39 positions). The occurrence of one species known from literature (*Salvia glutinosa*) had not been confirmed during field-work (Bazan, Tarnawski 2007). Positions that have not been published so far constitute 65.16% of the total number of findings (55 species).

In terms of the number of species found, forest communities dominate (*Quercus-Fagetum*, *Alnetum glutinosae* and *Vaccinio-Piceetea* classes). Their species account for 54.41% of total findings. Positions outside the areas under the management of the State Forests constitute 2.62% of total findings (15 species in 18 positions).

In terms of phytosociology (Matuszkiewicz 2006), plant species in Sokołowiec forest administration region belong to the following syntaxonomic groups:

1. Water and marshy communities:  
*Scheuchzerio-Caricetea* class – 2 species,  
*Potametea* class – 3 species and  
*Oxyccoco-Sphagnetum* class – 1 species.

**Table 1.** The list of protected and endangered species of plants which appear in the scope of Sokołowiec forest administration region (Oleśnica forest district)

Special typeface and symbols used in the list of species

Categories of threats and conservation status of species (wg Ochrya 1992; Kącki et al. 2003; ACT 2004; Cieśliński et al. 2006; Zarzycki, Szeląg 2006)

Endangered species

EN – disappearing

VU, V – vulnerable

Species with lower risk of extinction:

NT – near threatened

LC – least concern

Species of unknown threats:

DD – date deficient.

Conservation status of species:

C – total protection,

Cz –partial protection.

| no. | Polish name          | Botanical name                                          | Location<br>(Unit, sub-unit)                                                                                                 | ATPOL<br>square      | Status of<br>the species<br>protection/<br>category of<br>threat | Comments                                |
|-----|----------------------|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------|-----------------------------------------|
| 1   | 2                    | 3                                                       | 4                                                                                                                            | 5                    | 6                                                                | 7                                       |
| 1.  | Barwinek pospolity   | <i>Vinca minor</i> L.                                   | 261a; 261b; 184h <sup>1</sup><br>298a,c; 297c <sup>8</sup>                                                                   | CE22<br>CE32         | Cz                                                               |                                         |
| 2.  | Bielistka siwa       | <i>Leucobryum glaucum</i><br>(Hedw.) Aongstr            | 180f,h; 181a; 182a,b,c,d; 184f,h; 185b; 186a,c; 216f<br>205a; 209a,f; 204f; 265h                                             | CE22<br>CE32         | Cz                                                               |                                         |
| 3.  | Bluszcz pospolity    | <i>Hedera helix</i> L.                                  | 298a <sup>8</sup> ,b,c; 297b <sup>8</sup> ,c; 202c; 271c,d,f,h,j; 273d; 272c;<br>203a; private forest <sup>1)</sup><br>260Aa | CE32<br>CE22         | Cz                                                               | <sup>1)</sup> E17°26'46",<br>N51°14'31" |
| 4.  | Bobrek trójlistkowy  | <i>Menyanthes trifoliata</i> L.                         | 184a <sup>5</sup><br>276f <sup>3</sup><br>268c <sup>2</sup>                                                                  | CE22<br>CE31<br>CE32 | Cz/VU                                                            |                                         |
| 5.  | Brodaczka zwyczajna  | <i>Usnea filipendula</i> Stirt.                         | 181c;185d,c                                                                                                                  | CE22                 | C/VU                                                             |                                         |
| 6.  | Brodawkowiec czysty  | <i>Pseudoscleropodium purum</i><br>(Hedw.) Fleish.      | 181d; 182a; 262b<br>264h; 263c; 204f                                                                                         | CE22<br>CE32         | Cz                                                               |                                         |
| 7.  | Chrobotek gronkowy   | <i>Cladoniabotrytes</i><br>(K.G. Hagen) Willd.          | 181a                                                                                                                         | CE22                 | EN                                                               |                                         |
| 8.  | Chrobotek leśny      | <i>Cladonia arbuscula</i> (Wallr.)<br>Flot.em. Ruoss    | 185b; 181h; 182c; 186b,c; 187b<br>209d                                                                                       | CE22<br>CE32         | Cz                                                               |                                         |
| 9.  | Chrobotek najeżony   | <i>Cladonia portentosa</i><br>(Dufour) Coem.            | 181c,h                                                                                                                       | CE22                 | Cz                                                               |                                         |
| 10. | Chrobotek reniferowy | <i>Cladonia rangiferina</i> (L.)<br>Weber ex F.H. Wigg. | 185c; 181h; 182b                                                                                                             | CE22                 | Cz                                                               |                                         |

| 1   | 2                           | 3                                                    | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5                    | 6  | 7                                                                                   |
|-----|-----------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----|-------------------------------------------------------------------------------------|
| 11. | Chrobotek smukły            | <i>Cladonia ciliata</i> (Stirt.)<br>Harm.            | 209f,d                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CE32                 | Cz |                                                                                     |
| 12. | Cis pospolity               | <i>Taxus baccata</i> L.                              | 273a <sup>8</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                      | CE32                 | Cz |                                                                                     |
| 13. | Czartawa pośrednia          | <i>Circaea intermedia</i> Ehrh.                      | 217a; 261b                                                                                                                                                                                                                                                                                                                                                                                                                                             | CE22                 | LC |                                                                                     |
| 14. | Drabik drzewkowaty          | <i>Climacium dendroides</i><br>(Hedw.) Web. and Mohr | 268c<br>216i                                                                                                                                                                                                                                                                                                                                                                                                                                           | CE32<br>CE22         | Cz |                                                                                     |
| 15. | Dziubkowiec<br>bruzdkowany  | <i>Eurhynchium striatum</i><br>(Hedw.) Schimp.       | 261a; 184h                                                                                                                                                                                                                                                                                                                                                                                                                                             | CE22                 | Cz |                                                                                     |
| 16. | Dziubkowiec<br>Zetterstedta | <i>Eurhynchium angustirete</i><br>(Broth.) T. Kop.   | 203a; 271j; 263d                                                                                                                                                                                                                                                                                                                                                                                                                                       | CE32                 | Cz |                                                                                     |
| 17. | Fałdownik nastroszony       | <i>Rhytidiadelphus squarrosus</i><br>(Hedw.) Warnst. | 184h; 217a,ax, bx<br>215k                                                                                                                                                                                                                                                                                                                                                                                                                              | CE22<br>CE32         | Cz |                                                                                     |
| 18. | Fałdownik trzyczędowy       | <i>Rhytidiadelphus triquetrus</i><br>(Hedw.) Warnst. | 184h                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CE22                 | Cz |                                                                                     |
| 19. | Gajnik lśniący              | <i>Hylocomium splendens</i><br>(Hedw.) Schimp.       | 266f,g<br>180h; 184c,d,f; 181a; 182b,c,d; 185b,c                                                                                                                                                                                                                                                                                                                                                                                                       | CE32<br>CE22         | Cz |                                                                                     |
| 20. | Grażel żółty                | <i>Nuphar luteum</i> (L.) Sibth.<br>and Sm.          | 184g <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                      | CE22                 | Cz |                                                                                     |
| 21. | Groszek błotny              | <i>Lathyrus palustris</i> L.                         | 184h <sup>5</sup><br>276f <sup>3</sup> ; private wasteland <sup>9 1)</sup><br>215b <sup>4</sup>                                                                                                                                                                                                                                                                                                                                                        | CE22<br>CE31<br>CE32 | NT | <sup>1)</sup> E17°25'20",<br>N51°14'01"                                             |
| 22. | Groszek skrzydlasty         | <i>Lathyrus montanus</i> Bernh.                      | 267g; 264b<br>261f                                                                                                                                                                                                                                                                                                                                                                                                                                     | CE32<br>CE22         | NT |                                                                                     |
| 23. | Gruszyca okrągłolistna      | <i>Pyrola rotundifolia</i> L.                        | 186b                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CE22                 | LC |                                                                                     |
| 24. | Kalina koralowa             | <i>Viburnum opulus</i> L.                            | 260Aa; 183n <sup>8</sup> ; 184h <sup>5</sup> ; 186a <sup>8</sup><br>268d <sup>1</sup> ; 267d <sup>1</sup> ; 215c,t <sup>8</sup><br>276f <sup>3</sup> ; private meadow <sup>1)</sup>                                                                                                                                                                                                                                                                    | CE22<br>CE32<br>CE31 | Cz | <sup>1)</sup> E17°25'20",<br>N51°14'20"                                             |
| 25. | Kocanki piaskowe            | <i>Helichrysum arenarium</i> L.                      | private meadow <sup>1)</sup> ; private meadow <sup>2)</sup>                                                                                                                                                                                                                                                                                                                                                                                            | CE22                 | Cz | <sup>1)</sup> E17°28'32",<br>N51°16'24",<br><sup>2)</sup> E17°28'37",<br>N51°16'15" |
| 26. | Kokorycz wątła              | <i>Corydalis intermedia</i> (L.)<br>Merat            | 262a <sup>6</sup> ; 261c; 260Aa; private forest <sup>1)</sup><br>268d                                                                                                                                                                                                                                                                                                                                                                                  | CE22<br>CE32         | LC | <sup>1)</sup> E17°29'50",<br>N51°16'51"                                             |
| 27. | Konwalia majowa             | <i>Convallaria majalis</i> L.                        | 260Aa,b <sup>8</sup> ,c <sup>8</sup> ,d,f <sup>8</sup> ; 261b <sup>8</sup> ,f <sup>8</sup> ,g <sup>5</sup> ; 262b <sup>8</sup> ,c,f <sup>8</sup><br>263a <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ,h <sup>8</sup> ,i,l; 264b,d <sup>8</sup> ,f <sup>8</sup> ,h; 202a,c <sup>8</sup> ; 203c <sup>8</sup> ,g; 204a <sup>8</sup> ,<br>211a <sup>8</sup> ; 212a <sup>8</sup> ,b <sup>8</sup> ; 213b <sup>8</sup> ,c <sup>8</sup> ; 298a,d <sup>8</sup> | CE22<br>CE32         | Cz |                                                                                     |
| 28. | Kopytnik pospolity          | <i>Asarum europaeum</i> L.                           | 184a <sup>8</sup> ; 216j <sup>1</sup> ,b; 260Aa; private forest <sup>1)</sup><br>215k                                                                                                                                                                                                                                                                                                                                                                  | CE22<br>CE32         | Cz | <sup>1)</sup> E17°29'49",<br>N51°16'46"                                             |

| 1   | 2                         | 3                                                             | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5                    | 6      | 7                                       |
|-----|---------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------|-----------------------------------------|
| 29. | Kosaciec syberyjski       | <i>Iris sibirica</i> L.                                       | private meadow <sup>7 1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | CE32                 | C/VU/V | <sup>1)</sup> E17°28'26",<br>N51°16'04" |
| 30. | Kostrzewa leśna           | <i>Festuca altissima</i> All.                                 | 183n                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CE22                 | LC     |                                         |
| 31. | Kruszyna pospolita        | <i>Frangula alnus</i> Mill.                                   | 180b <sup>8</sup> ,h <sup>8</sup> ,i <sup>8</sup> ; 181b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ; 182a <sup>8</sup> ,b <sup>8</sup> ,c <sup>8</sup> ;<br>183a,b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ,g <sup>8</sup> ,h <sup>8</sup> ,j <sup>8</sup> ,n,l; 184a <sup>8</sup> ,b <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ,h <sup>8</sup> ,i <sup>8</sup> ;<br>185b <sup>8</sup> ,f <sup>8</sup> ; 186b <sup>8</sup> ,c <sup>8</sup> ,f <sup>8</sup> ; 187a <sup>8</sup> ,c <sup>8</sup> ; 216a,b,c <sup>8</sup> ,d,f <sup>8</sup> ,g <sup>8</sup> ,h <sup>8</sup> j <sup>1</sup> ;<br>217h <sup>8</sup> ,i <sup>8</sup> ,j <sup>8</sup> ,ax <sup>8</sup> ; 260Aa <sup>8</sup> ,b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ; 261a <sup>8</sup> ,b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ,g <sup>8</sup> ;<br>262a <sup>8</sup> ,b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup><br>202a <sup>8</sup> ,c <sup>8</sup> ,b <sup>8</sup> ,f <sup>8</sup> ; 203a,c,g <sup>8</sup> ,h <sup>8</sup> ,f; 204b,f,i,j <sup>8</sup> ;<br>205a <sup>8</sup> ,b <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ,g <sup>8</sup> ; 206a <sup>8</sup> ,b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ; 207a <sup>8</sup> ,b <sup>8</sup> ,c <sup>8</sup> ;<br>208a <sup>8</sup> ,b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ; 209a,b <sup>8</sup> ,c,f <sup>8</sup> ; 211a <sup>8</sup> ,b <sup>8</sup> ; 212a <sup>8</sup> ,b <sup>8</sup> ,f;<br>213a,b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,g,f <sup>8</sup> ; 214a <sup>8</sup> ,b,c <sup>8</sup> ,g <sup>8</sup> ,j <sup>8</sup> ,m,n <sup>8</sup> ,i;<br>215a <sup>8</sup> ,f <sup>8</sup> ,h <sup>8</sup> ,k,l <sup>8</sup> ,n <sup>8</sup> ; 263c <sup>8</sup> ,d,f,g <sup>8</sup> ,h <sup>8</sup> ,i; 264a,b,c,d,f,g;<br>265a <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,f,g <sup>8</sup> ,h <sup>8</sup> ; 266a <sup>8</sup> ,b <sup>8</sup> ,c <sup>8</sup> ,f <sup>8</sup> ,g <sup>8</sup> ,h <sup>8</sup> ,i <sup>8</sup> ;<br>267a <sup>8</sup> ,b <sup>1</sup> ,c <sup>8</sup> ,j <sup>8</sup> ,k,l <sup>8</sup> ,f <sup>8</sup> ,g <sup>8</sup> ,i <sup>8</sup> ; 268b <sup>4</sup> ,d <sup>8</sup> ,c <sup>8</sup> ,f <sup>8</sup> ;<br>271b <sup>8</sup> ,k <sup>8</sup> ,l <sup>8</sup> ; 272b,c <sup>8</sup> ,d <sup>8</sup> ,h,i; 273a <sup>8</sup> ; 274b,d <sup>1</sup> ,g,i,f <sup>8</sup> ,h <sup>8</sup> ;<br>275g,f <sup>8</sup> ,a,c <sup>8</sup> ,d,h; 277b; 297a,b,c <sup>8</sup> ; 298a <sup>8</sup> ,b <sup>8</sup> ,c,d <sup>8</sup> ,f <sup>8</sup><br>193a <sup>1</sup> ,b <sup>8</sup> ; 210b <sup>8</sup> ,c <sup>8</sup> ,d <sup>8</sup> ,f <sup>8</sup> ,g <sup>8</sup> ,h <sup>8</sup> ,i <sup>8</sup> ,j <sup>8</sup> ; 276a <sup>8</sup> ,b,c,d,f <sup>8</sup> | CE32<br>CE31         |        |                                         |
| 32. | Kukułka plamista          | <i>Dactylorhiza maculata</i> (L.)<br>Soo                      | private meadow <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CE22                 | C/VU   | <sup>1)</sup> E17°29'22",<br>N51°16'36" |
| 33. | Kukułka szerokolistna     | <i>Dactylorhiza majalis</i> (RCHB.)<br>P.F. Hunt and Summerh. | 268a <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | CE32                 | C/NT   |                                         |
| 34. | Listera jajowata          | <i>Listera ovata</i> (L.) R. Br.                              | 184a <sup>5</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | CE22                 | C      |                                         |
| 35. | Mąkla tarniowa            | <i>Evernia prunastri</i> (L.) Ach.                            | 184f,b; 180b,f, 181c,185d,c<br>211a; 213b; 264f; 268b; 267j                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | CE22<br>CE32         | Cz/NT  |                                         |
| 36. | Mąklik otrębiasty         | <i>Pseudevernia furfuracea</i> (L.)<br>Zopf                   | 180b, 181c,185d,c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | CE22                 | C      |                                         |
| 37. | Mokradłoszka<br>zaostzona | <i>Calliergonella cuspidata</i><br>(Hedw.) Loeske             | 184a,h<br>276f<br>268c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CE22<br>CE31<br>CE32 | Cz     |                                         |
| 38. | Ostróżeczka polna         | <i>Consolida regalis</i> Gray                                 | 275h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CE32                 | LC     |                                         |
| 39. | Pierwiosnka lekarska      | <i>Primula veris</i> L.                                       | 262b <sup>6</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | CE22                 | Cz     |                                         |
| 40. | Piórosz pierzasty         | <i>Ptilium crista-castrensis</i><br>(Hedw.) De Not.           | 205a; 266f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CE32                 | Cz     |                                         |
| 41. | Płonnik pospolity         | <i>Polytrichum commune</i> Hedw.                              | 211a; 212a<br>217x; 262b                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | CE32<br>CE22         | Cz     |                                         |
| 42. | Płucnica islandzka        | <i>Cetraria islandica</i> (L.)<br>Acharius                    | 181d,h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CE22                 | Cz/VU  |                                         |

| 1                           | 2                                                        | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4                    | 5    | 6 | 7                                       |
|-----------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------|---|-----------------------------------------|
| 43. Płucnik modry           | <i>Platismatia glauca</i> (L.)<br>W.L.Culb and C.F. Culb | 180f; 184f,b                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CE22                 | C    |   |                                         |
| 44. Pomocnik baldaszkowy    | <i>Chimaphila umbellata</i> (L.)<br>W.P.C.Barton         | 186b; 182d                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CE22                 | C/EN |   |                                         |
| 45. Porzeczka czarna        | <i>Ribes nigrum</i> L.                                   | 276f <sup>3</sup><br>268c,f<br>262a; 261a,c; 260Aa; 216f <sup>l</sup> ; 184a <sup>5</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CE31<br>CE32<br>CE22 | Cz   |   |                                         |
| 46. Próchniczek błotny      | <i>Aulacomnium palustre</i><br>(Hedw.) Schwägr.          | private meadow <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CE32                 | Cz   |   | <sup>1)</sup> E17°25'32",<br>N51°14'09" |
| 47. Przytulnia wonna        | <i>Galium odoratum</i> (L.) Scop.                        | 260Aa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CE22                 | Cz   |   |                                         |
| 48. Rokietnik pospolicie    | <i>Pleurozium schreberi</i><br>(Willd.) Mitten.          | 263a,b,d,f,g,h; 264a,b,c,d,f,g,h i; 265a,b,c,d,f,g,h;<br>266a,b,c,d,f,g,h,i; 267a,b,c,d,f,g,i,k; 268f; 271h,i;<br>272b,d,h,i,g; 273b,c,d,g,i,j; 274b,g,h,i,d,f;<br>275a,b,c,d,f,g,h; 297a,b,c,d; 298a,b,c; 277b;<br>209a,b,c,d,f; 208a,b,c,f; 207a; 206b,c; 205a,b,c,d;<br>204b,c,d,f,i,j; 203a,b,c,f,g,h,i; 202a,b,c,d,f; 211a,b;<br>212a,b; 213b,c,d; 214a,c;<br>276d; 193a,b; 210a,c,d;<br>182a,b,c,d; 183a,b,f,c,d; 181a,b,c,d,g,f,h;<br>180d,g,h,i,b,f; 184b,c,d,f; 185a,b,c,d,f; 186a,b,c,d, f;<br>187a,b,c; 216a,f; 260Ab,c,d, f; 261b,d,f,g; 262b,c,d,f;<br>216f; 217a,ax,bx,fx | CE31<br>CE22         | Cz   |   |                                         |
| 49. Rutewka wąskolistna     | <i>Thalictrum lucidum</i> L.                             | 184a <sup>5</sup><br>276f <sup>3</sup> ; private wasteland <sup>9 1)</sup><br>215b <sup>4</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CE22<br>CE31<br>CE32 | LC   |   | <sup>1)</sup> E17°25'21",<br>N51°13'58" |
| 50. Rzęśl hakowata          | <i>Callitriche hamulata</i> Kutz.<br>Ex W.D.J. Koch      | 215 c; 214b                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CE32                 | DD   |   |                                         |
| 51. Siedmiopalecznik błotny | <i>Comarum palustre</i> L.                               | private meadow <sup>1)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CE32                 | NT   |   | <sup>1)</sup> E17°25'32",<br>N51°14'09" |
| 52. Skrzyp olbrzymi         | <i>Equisetum telmateia</i> Ehrh.                         | 184a <sup>5</sup><br>private wasteland <sup>9 1)</sup><br>268d <sup>4</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | CE22<br>CE32<br>CE32 | C/VU |   | <sup>1)</sup> E17°25'17",<br>N51°14'10" |
| 53. Starzec błotny          | <i>Senecio congestus</i> (R.BR.)<br>D.C.                 | 184g <sup>5</sup><br>private wasteland <sup>9 1)</sup><br>214b <sup>4</sup> ; 215c <sup>4</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | CE22<br>CE31<br>CE32 | VU   |   | <sup>1)</sup> E17°25'24",<br>N51°14'00" |

| 1   | 2                      | 3                                                | 4                                                                                                                                                                             | 5                    | 6      | 7                                                                                                                             |
|-----|------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------|-------------------------------------------------------------------------------------------------------------------------------|
| 54. | Starzec kędzierzawy    | <i>Senecio rivularis</i><br>(Waldst. & Kit.) DC. | 268a <sup>6</sup> ,d <sup>6</sup> ,c; 215c; 214m<br>216i                                                                                                                      | CE32<br>CE22         | NT     |                                                                                                                               |
| 55. | Śniedek baldaszkowaty  | <i>Ornithogalum umbellatum</i> L.                | 187c                                                                                                                                                                          | CE22                 | LC     |                                                                                                                               |
| 56. | Śnieżycza wiosenna     | <i>Leucojum vernum</i> L.                        | 260Aa <sup>6</sup> ; private meadow <sup>1)</sup>                                                                                                                             | CE22                 | C/NT/V | <sup>1)</sup> E17°29'53",<br>N51°16'51"                                                                                       |
| 57. | Śnieżyczka przebiśnieg | <i>Galanthus nivalis</i> L.                      | 260Aa<br>297c <sup>6</sup>                                                                                                                                                    | CE22<br>CE32         | C/NT   | Likely<br>synanthropic<br>habitat                                                                                             |
| 58. | Szałwia lepka          | <i>Salvia glutinosa</i> L.                       | Proposed ecological wasteland 'Uroczysko<br>Grotowskiego – Małe Brzezie' <sup>5</sup>                                                                                         | CE22                 | RE     | Without<br>confirmation                                                                                                       |
| 59. | Torfowiec nastroszony  | <i>Sphagnum squarrosum</i> L.                    | 260Aa; 184h<br>268c                                                                                                                                                           | CE22<br>CE32         | Cz     |                                                                                                                               |
| 60. | Torfowiec błotny       | <i>Sphagnum palustre</i> L.                      | 184h                                                                                                                                                                          | CE22                 | C      |                                                                                                                               |
| 61. | Tujowiec tamaryszkowy  | <i>Thuidium tamariscinum</i><br>(Hedw.) Br. Eur. | 184h; 260Aa                                                                                                                                                                   | CE22                 | Cz     |                                                                                                                               |
| 62. | Turzyca tunikowa       | <i>Carex appropinquata</i> Schum.                | 215c <sup>4</sup> ,a <sup>4</sup> ; 214a <sup>4</sup> ; private meadow <sup>1)</sup><br>private wasteland <sup>9 2)</sup><br>private meadow <sup>3)</sup> ; 216h <sup>5</sup> | CE32<br>CE31<br>CE22 | NT     | <sup>1)</sup> E17°28'32",<br>N51°16'04"<br><sup>2)</sup> E17°25'14",<br>N51°14'06"<br><sup>3)</sup> E17°29'15",<br>N51°16'36" |
| 63. | Wawrzynek wilcze łyko  | <i>Daphne mezereum</i> L.                        | 260Aa; 184a <sup>8</sup> ; 216b <sup>8</sup> ,g <sup>5</sup> ; 217h <sup>8</sup> ,i <sup>8</sup><br>214m <sup>4</sup> ; 213a <sup>8</sup>                                     | CE22<br>CE32         | C      |                                                                                                                               |
| 64. | Widłak goździsty       | <i>Lycopodium clavatum</i> L.                    | 203a<br>182b                                                                                                                                                                  | CE32<br>CE22         | C/VU   |                                                                                                                               |
| 65. | Widłak jałowcowaty     | <i>Lycopodium annotinum</i> L.                   | 266i <sup>6</sup>                                                                                                                                                             | CE32                 | C/VU   |                                                                                                                               |
| 66. | Widłóżab kędzierzawy   | <i>Dicranum polysetum</i> SW.                    | 180i,h; 184d,f; 182b; 181a,c,h,d; 185b,c; 186a,b,c,f;<br>187a,c<br>204f; 208b; 209a,b,c; 266f,g,b                                                                             | CE22<br>CE32         | Cz/VU  |                                                                                                                               |
| 67. | Widłóżab miotłowy      | <i>Dicranum scoparium</i> (L.)<br>Hedw.          | 181a,c,h; 185b,c; 187a,c; 182b; 186b,f<br>264g; 209a,b; 204f; 208b; 205g                                                                                                      | CE22<br>CE32         | Cz     |                                                                                                                               |
| 68. | Włosienicznik wodny    | <i>Batrachium aquatile</i> (L.)<br>Dum.          | 184a <sup>5</sup><br>276f <sup>3</sup>                                                                                                                                        | CE22<br>CE31         | C      |                                                                                                                               |

**Source:**

<sup>1)</sup>Kossowska, Turzańska 1993, <sup>2)</sup>Stefańska-Krzaczek, Kącki 2009b, <sup>3)</sup>Bazan, Tarnawski 2005a, <sup>4)</sup>Bazan, Tarnawski 2005b, <sup>5)</sup>Bazan, Tarnawski 2007, <sup>6)</sup>Gorzelak 2008, <sup>7)</sup>Gorzelak (in press),

<sup>8)</sup>BULiGL 2003, <sup>9)</sup>Tarnawski 2004.

2. Communities of broadly defined grasslands (meadows, swards and pastures):  
*Molinio-Arrhenatheretea* class – 5 species,  
*Nardo-Callunetea* class – 2 species and  
*Koelerio-Corynephoretea* class – 1 species
3. Forest and forest edge herb/creeper communities:  
*Querc-Fagetea* class – 16 species,  
*Alnetea glutinosae* class – 4 species,  
*Vaccinio-Piceetea* class – 17 species and  
*Rhamno-Prunetea* class – 2 species.
4. Segetal, ruderal and cut-over communities:  
*Stellarietea mediae* class – 1 species.
5. Phragmiton and Magnocaricion communities:  
*Phragmitetea* class – 1 species.

In addition, 13 species represent other communities.

## 5. Discussion and conclusions

A detailed inventory of protected and endangered flora species within the Sokołowiec forest administration region considerably supplemented the results of studies previously conducted in this area. Almost two-third of the number of positions has not been registered before, although within the Sokołowiec forest administration region numerous protected areas are situated (three ecological sites, one proposed ecological site and Natura 2000 site).

Considering the changing nature of Polish forests associated with reconstruction of solid pines in stands representing habitats, changes in plant communities due to discontinuation of certain aspects of traditional use of forest lands (grazing and collection of litter), the influence of nitrogen compounds on vegetation and soil, climate changes and the preservation of biological diversity, these data can provide an excellent base, useful for planning both nature conservation and silviculture activities (Krzyżanowski et al. 2002; Czerepko, Sokołowski 2006; Matuszkiewicz (ed.) 2007; Szwagrzyk 2007; Korzeniak 2009; Załuski 2009). This fact is of great importance, especially in relation to the conclusion that such high percentage of unknown flora positions is not a single case, but it is the fact confirmed in the literature (Kački et al. 2003).

Conservation of rare and endangered habitats of flora in the forests does not require ceasing the utilisation of wood resources or excluding forest lands from use. It only requires modification of standard activities related to the conservation and silviculture, performed within the forest management plan for forest districts of PGLLP (Państwowe Gospodarstwo Leśne Lasy Państwowe —

The State Forests National Forest Holding), although sometimes it may be a burden for forest economy (Kujawa-Pawlaczyk, Pawlaczyk 2001, 2003; Fałtynowicz 2006; Szwagrzyk 2007; Referowska-Chodak 2010).

Activities such as cleaning, thinning or use of final cutting of stand should be preceded by field inspection to identify rare and protected species of flora. Attention should be paid to epiphytic lichen species, among which there are also endangered species (four species at 22 positions in the studied forest administration region).

The consequence will be, as far as possible, the full protection of these species, through the location of strip roads outside their positions, avoiding felling and locating landing in the areas of their occurrence or location of ecological large tree groups appointed under final cutting in places where rare species occur.

Activities related to forest protection and their exact location in the field, i.e. placing of chewing trees for deer or putting classic traps for secondary pests, should also be planned on the basis of field inspection to avoid the accidental destruction of valuable flora positions (Berdowski 2003; Fałtynowicz 2006; Olaczek 2007; Gorzelak 2008, 2009).

At the same time, it should be concluded that forest economy itself is sometimes one of the factors generating the spread or protection of certain species by ecological niches that are created during silviculture operations, e.g. the spread of the lichens of *Cladonia* genus along roads and trip roads (Kujawa-Pawlaczyk, Pawlaczyk 2003; Fałtynowicz 2006).

Data on the state of flora should be included in the conservation plan together with detailed recommendations for actions needed for the conservation of positions of these species. Unfortunately, the methodology of forest management plan is not able to cover the full inventory of endangered and protected species of plants, which is clearly visible in our research material – the data on the positions of rare and protected plant species, developed on the basis of forest management plan (Plan Urządzenia Lasu, PUL) (Bureau for Forest Management and Geodesy 2003) for the Oleśnica Forest District, constitute 26.82% of the overall positions and 11.76% of the number of species identified in the study, whereby the main inventoried species was the alder buckthorn (80.97% of the number of positions found in PUL). Therefore, it is advisable to use the information from the field workers of the State Forests and supplement data based on the literature as well as the consultations with specialists. This entails also a good recognition of species by field workers of the State Forests, which should be supported through relevant training (Gorzelak 2008; Referowska-Chodak 2010).

Another aspect is the active protection of protected and endangered species of flora, which generates costs and burdens the State Forests, and so is inconsistent environmental law, especially regarding the Natura 2000 sites, which raises many serious questions concerning forest management in these areas — the problems have not been solved in a systemic manner (Szwagrzyk 2007; Referowska-Chodak 2010; Kacprzak 2011).

The results of the conducted research allow formulating the following conclusions:

1. The protection of positions of rare and endangered species of flora in the forests does not require ceasing the utilisation of wood resources or excluding forest lands from use.
2. Detailed identification of the positions of endangered and protected species of flora can provide an excellent base, useful for planning both nature conservation as well as silviculture activities.
3. The state of identification of sites of endangered and protected species of flora is quite insufficient, taking into account existing laws and trends in the broadly understood nature conservation.

## References

- Bazan S., Tarnawski D. 2005a. Proponowany użytek ekologiczny „Olśy Spalickie”. Maszynopis. Instytut Zoologiczny Uniwersytetu Wrocławskiego, Zakład Bioróżnorodności i Taksonomii Ewolucyjnej.
- Bazan S., Tarnawski D. 2005b. Proponowany użytek ekologiczny „Olśy Sokołowieckie”. Maszynopis. Instytut Zoologiczny Uniwersytetu Wrocławskiego, Zakład Bioróżnorodności i Taksonomii Ewolucyjnej.
- Bazan S., Tarnawski D. 2007. Proponowany użytek ekologiczny „Uroczysko Grotowskiego - Małe Brzeziny”. Maszynopis. Instytut Zoologiczny Uniwersytetu Wrocławskiego, Zakład Bioróżnorodności i Taksonomii Ewolucyjnej.
- Berdowski W. 2003. Zanikanie gatunków leśnych na Dolnym Śląsku, in: Zagrożone gatunki flory naczyniowej Dolnego Śląska [Endangered vascular plants of Lower Silesia] (ed. Z. Kącki). Instytut Biologii Roślin Uniwersytetu Wrocławskiego, Wrocław, Polskie Towarzystwo Przyjaciół Przyrody „Pro Natura”, p. 165–174. ISBN 8391962601.
- Brożek S., Zwydak M., 2003. Atlas gleb leśnych Polski. Warszawa. Centrum Informacji Lasów Państwowych, 466 p. ISBN 8388478176.
- BULiGL. 2003. Plan urządzania lasu dla Nadleśnictwa Oleśnica na lata 2003-2012. Maszynopis. Biuro Urządzania Lasu i Geodezji Leśnej w Brzegu.
- Cieśliński S., Czyżewska K., Fabiszewski J. 2006. Czerwona lista porostów w Polsce [Red list of the lichens in Poland], in: Czerwona lista roślin i grzybów Polski [Red list of plants and fungi in Poland] (eds. Z. Mirek, K. Zarzycki, W. Wojewoda, Z. Szelaż). Kraków, W. Szafer Institute of Botany, Polish Academy of Science, p. 71–90. ISBN 8389648385.
- Czerepko J., Sokołowski A. W. 2006. Zmiany roślinności mokradeł leśnych na terenie Białowieskiego Parku Narodowego w przeciągu ostatnich 30-40 lat badań. Materiały z konferencji jubileuszowej z okazji 85-lecia Białowieskiego Parku Narodowego „Nauka – Przyroda – Człowiek”, Białowieża, Wydawnictwo Białowieskiego Parku Narodowego, p. 39–58.
- Dzwonko Z. 2007. Przewodnik do badań fitosocjologicznych. Poznań - Kraków, Instytut Botaniki Uniwersytetu Jagiellońskiego, 304 p. ISBN9788389949233.
- Fałtynowicz W. 2003. The lichens, lichenicolous and allied fungi of Poland. An annotated checklist. Kraków, W. Szafer Institute of Botany, Polish Academy of Science.
- Fałtynowicz W. 2006. Porosty w lasach Polski - znaczenie, zagrożenie, ochrona [Lichens in Polish forests – importance, threats, conservation]. Rogów, *Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej*, 8 (4): 193–200.
- Gorzelak P. (in print). Nowe stanowisko kosańca syberyjskiego *Iris sibirica* L. (Iridaceae) na Dolnym Śląsku. *Acta Botanica Silesiaca*.
- Gorzelak P. 2008. Zagrożone oraz chronione gatunki flory naczyniowej Równiny Oleśnickiej oraz zachodniej części Wzgórz Trzebnickich [Endangered and protected species of the vascular flora of the Równina Oleśnicka Plain and the western part of the Wzgórz Trzebnickie Hills]. *Acta Botanica Silesiaca*, 3: 107–120.
- Gorzelak P. 2009. Nowe stanowisko widlicza spleśzczonego *Diphasiastrum complanatum* L. (Lycopodiaceae) na Dolnym Śląsku i możliwości jego ochrony z punktu widzenia leśnika [The new stand of *Diphasiastrum complanatum* L. (Lycopodiaceae) in Lower Silesia and the possibilities of its protection from the standpoint of the forester]. *Acta Botanica Silesiaca*, 4: 125–133.
- Kacprzak P. 2011. Problemy gospodarki leśnej na obszarach Natura 2000. Warszawa, Wydawnictwo „Świat”, Biblioteczka Leśniczego, 335.
- Kącki Z., Dajdok Z., Szcześniak E. 2003. Czerwona lista roślin naczyniowych Dolnego Śląska [Red list of vascular plants of Lower Silesia], in: Zagrożone gatunki flory naczyniowej Dolnego Śląska [Endangered vascular plants of Lower Silesia] (ed. Z. Kącki). Wrocław, Instytut Biologii Roślin Uniwersytetu Wrocławskiego, Polskie Towarzystwo Przyjaciół Przyrody „Pro Natura”, p. 9–65. ISBN 8391962601.
- Kondracki J. 1988. Geografia fizyczna Polski. Warszawa, PWN, 463 p. ISBN8301023236.
- Korzeniak J. 2009. National monitoring of threats and the effectiveness of vascular plant protection in Poland, in: Rare, relict and endangered plants and fungi in Poland (eds. Z. Mirek, A. Nikel). Kraków, W. Szafer Institute of Botany, Polish Academy of Science, p. 31–40. ISBN9788389648785.
- Kossowska M., Turzańska M. 1993. Inwentaryzacja stanowisk chronionych gatunków roślin na terenie gminy Oleśnica. Maszynopis. Wojewódzki Konserwator Przyrody we Wrocławiu.
- Krzyżanowski A., Zajączkowski S., Zielony R. 2002. Struktura siedlisk leśnych w Polsce oraz kierunki zmian, in: Inżynieria ekologiczna, 6 (ed. J. Siuta) Warszawa, Polskie Towarzystwo Inżynierii Ekologicznej, p. 38–46. ISBN 8391139093.

- Kujawa-Pawlaczyk J., Pawlaczyk P. 2001. Rzadkie i zagrożone rośliny naczyniowe lasów Ziemi Lubuskiej i Łużyc. Świebodzin, Wydawnictwo Lubuskiego Klubu Przyrodników, 222 p. ISBN 8387846171.
- Kujawa-Pawlaczyk J., Pawlaczyk P. 2003. Ochrona rzadkich i zagrożonych roślin w lasach. Świebodzin, Wydawnictwo Lubuskiego Klubu Przyrodników, 118 p. ISBN8387846287.
- Matuszkiewicz J. M. 1993. Krajobrazy roślinne i regiony geobotaniczne Polski [Vegetation landscape and geobotanical regions of Poland]. *Prace Geograficzne*, 158: 5–107.
- Matuszkiewicz J. M. 2002. Zespoły leśne Polski. Warszawa, PWN, 357 p. ISBN 8301134011.
- Matuszkiewicz J. M. (ed.) 2007. Geobotaniczne rozpoznanie tendencji rozwojowych zbiorowisk leśnych w wybranych regionach Polski. Warszawa, PAN, Instytut Geografii i Przestrzennego Zagospodarowania im. S. Leszczyckiego, Monografie 8, 976 p. ISBN9788387954780.
- Matuszkiewicz W. 2006. Przewodnik do oznaczania zbiorowisk roślinnych Polski. Warszawa, PWN, 537 p. ISBN9788301144395.
- Mirek Z., Piękoś-Mirkowa H., Zajac A., Zajac M., Paul W., Ronikier M. et al. 2002. Flowering plants and pteridophytes of Poland a checklist. Biodiversity of Poland, 1. Kraków, W. Szafer Institute of Botany, Polish Academy of Sciences, 442 p. ISBN 8385444831.
- Natura 2000 viewer. Natura 2000 – Standard Data Form -Dolina Oleśnicy i Potoku Boguszyckiego, PLH020091. European Environment Agency. <http://natura2000.eea.europa.eu/natura2000/SDF.aspx?site=PLH020091#1> [04.02.2012].
- Nowak J., Tobolewski K. 1975. Porosty polskie. Opisy i klucze do oznaczania porostów w Polsce dotychczas stwierdzonych lub prawdopodobnych. Warszawa – Kraków, PWN, 1177 p.
- Ochyra R. 1992. Czerwona lista mchów zagrożonych w Polsce [Red list of threatened mosses in Poland], in: Czerwona lista roślin zagrożonych w Polsce [List of threatened plants in Poland] (ed. K. Zarzycki, W. Wojewoda) Warszawa, PWN, p.79–85.
- Ochyra R., Żarnowiec J., Bednarek-Ochyra H. 2003. Census catalogue of Polish mosses, in: Biodiversity of Poland, 3 (ed. Z. Mirek), p. 1–172. ISBN 838544484X.
- Ołaczek R. 2007. Inwentaryzacja przyrodnicza w Lasach Państwowych – kolejny krok na drodze ekologizacji gospodarki leśnej [Biological inventory in state forests – next step to ecologize forest industry], in: Siedliska i gatunki wskaźnikowe w lasach [Habitats and indicative species in the forests] (ed. D. Anderwald). Rogów, *Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej*, 2/3 (16): 20–34.
- PGLLP. 1999. Zarządzenie Nr 11 A Dyrektora Generalnego Lasów Państwowych z dnia 11 maja 1999 r. zmieniające Zarządzenie Nr 11 Dyrektora Generalnego Lasów Państwowych z dnia 14 lutego 1995 roku w sprawie doskonalenia gospodarki leśnej na podstawach ekologicznych. Państwowe Gospodarstwo Leśne Lasy Państwowe.
- Referowska-Chodak E. 2010. Leśne chronione gatunki roślin naczyniowych [Protected forest species of vascular plants], in: Unia Europejska dla zachowania różnorodności biologicznej polskich lasów European Union for the conservation of Polish forest biodiversity]. (ed. D. Anderwald). *Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej*, 2 (25): 388–404.
- Rothmaler W. 2009. Exkursionsflora von Deutschland, Band 3. Gefäßpflanzen: Atlasband. Heidelberg, Spektrum Akademischer Verlag, 753 p. ISBN 9783827418425.
- Rutkowski L. 2004. Klucz do oznaczania roślin naczyniowych Polski niżowej. Warszawa, PWN, 814 p. ISBN 8301143428.
- Schmuck A. 1959. Zarys klimatologii Polski. Warszawa, PWN, 160 p.
- Stefańska-Krzaczek E., Kącki Z. 2009a. Identyfikacja leśnych siedlisk przyrodniczych NATURA 2000 na przykładzie Nadleśnictwa Oleśnica Śląska [Identification of NATURA 2000 forest habitats on the example of Oleśnica Śląska Forest District]. *Leśne Prace Badawcze*, 70 (1): 77–88.
- Stefańska-Krzaczek E., Kącki Z. 2009b. Fitosocjologiczna charakterystyka leśnych siedlisk przyrodniczych Europejskiej Sieci Ekologicznej Natura 2000 w nadleśnictwie Oleśnica Śląska [Phytosociological characteristics of the forest habitats of European Ecological Natura 2000 Network in Oleśnica Śląska Forest Inspectorate]. *Acta Botanica Silesiaca*, 4: 15–42.
- Szafran B. (elaborated by) 1957. Mchy (Musci), vol. 1, in: Flora Polska, Rośliny Zarodnikowe Polski i Ziem Ościennych. Warszawa, PWN, 448 p.
- Szafran B. (elaborated by) 1961. Mchy (Musci), vol. 2, in: Flora Polska, Rośliny Zarodnikowe Polski i Ziem Ościennych. Warszawa, PWN, 405 p.
- Szwagrzyk J. 2007. Przestrzenne aspekty ochrony przyrody w lasach [Spatial aspects of environmental protection in forests], in: Siedliska i gatunki wskaźnikowe w lasach [Habitats and indicative species in the forests] (ed. D. Anderwald). Rogów, *Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej*, 2/3 (16): 11–19.
- Tarnawski D. 2004. Proponowany użytek ekologiczny „Mokradła Boguszyckie”. Maszynopis. Instytut Zoologiczny Uniwersytetu Wrocławskiego, Zakład Bioróżnorodności i Taksonomii Ewolucyjnej.
- Trampler T., Kliczkowska A., Dmyterko E., Sierpińska A. 1990. Regionalizacja przyrodniczo-leśna Polski na podstawach ekologiczno-fizjograficznych. Warszawa, Państwowe Wydawnictwo Rolnicze i Leśne, 155 p.
- Ustawa z dnia 16 kwietnia 2004 r. o ochronie przyrody. Dz.U. z 2004 r. Nr 92, poz. 880, z 2005 r. Nr 113, poz. 954, Nr 130, poz. 1087.
- Ustawa z dnia 28 września 1991 r. o lasach. Dz.U. 1991 nr 101 poz. 444.
- Zajac A., Zajac M. (eds.) 2001. Atlas rozmieszczenia roślin naczyniowych w Polsce. Kraków, Pracownia Chorologii Komputerowej Instytutu Botaniki Uniwersytetu Jagiellońskiego, 714 p. ISBN 8391516113.
- Załuski T. 2009. A voice in the discussion on threatened species. in: Rare, relict and endangered plants and fungi in Poland. (eds Z. Mirek, A. Nikel) Kraków, W. Szafer-Institute of Botany, Polish Academy of Science, p. 61–76. ISBN9788389648785.
- Zarzycki K., Szelać Z. (eds.) 2006. Czerwona lista roślin naczyniowych w Polsce, in: Czerwona lista roślin i grzybów Polski. (eds. Z. Mirek, K. Zarzycki, W. Wojewoda, Z. Szelać) Kraków, Instytut Botaniki im. W. Szafera, PAN, p. 9–20. ISBN8389648385.